Alternate Format Ballot

TABLE OF CONTENTS

Executive Summary	3
1. Introduction	Δ
1.1 System Description	4
1.2 Ballot Marking Process	4
2. HTML Ballot Functional Overview	ε
2.1 Enabling Voters With Disabilities to Vote Privately and Independently	ε
2.2 Ballot Functional Diagram	8
2.3 County Staff AFB Training	g
2.4 Voter Instructions – On Website	9
2.5 Voter Instructions – Within the Ballot	9
3. County Interaction and Ballot Generation	10
3.1 County Role in Ballot Generation	10
3.2 Returning Summary Pages to the County	13
3.3 Scanning and Tabulation Using Ballot on Demand Printers	13
4. Acceptance and Accessibility Testing	14
4.1 Acceptance Testing	14
4.2 Accessibility Testing	14
5. Registration Page Additions for Hosting HTML Ballots	15
5.1 Download Pages – Where to Host the Ballots	16
5.2 How a Voter Gets the Right Ballot Style – How the Magic Happens	16
5.3 Website Coding Materials	16
5.4 Simplified Voter Instructions	16
6. AFB System Meets Security Standards	17
Appendix A	18
Alternate Format Ballot (AFB) Process	18
Appendix B	19
Sample English and Chinese HTML Ballot Screen Shots	19
Appendix C	20
Sample English and Chinese AFB Summary Pages with Barcodes	20

Alternate Format Ballot

Executive Summary

The Five Cedars Group's Alternate Format Ballot system is an existing, proven, accessible vote-by-mail solution for providing voters with disabilities the means to vote independently and privately, using their own assistive systems.

The Alternate Format Ballot (AFB) was designed specifically to meet the needs of voters with disabilities. The AFB has truly touched people's lives in a positive way. The AFB creation process and accessibility factors were specifically designed to work within an existing vote-by-



mail system.

Fig. 1 - Senior citizen voting in her bathrobe at a rehab facility

In 2007, Five Cedars bid on and won the opportunity to build the Alternate Format Ballot product for the Oregon Secretary of State. The AFB process and ballots got their first test during the May 2008 Primary. This is a quote from a voter in that first election:

"The Alternate Format Ballot has given me the ability to do something I've never been able to do in my 18 years of being a registered voter--it has provided me the opportunity to mark my ballot privately and independently." –

- Angel C. Hale, Training Center Director, Oregon Commission for the Blind

Since then, the Alternate Format Ballot has been used by all 36 Oregon counties for all state, federal and local elections. While the early versions only worked on PC's with JAWS and ZoomText, today voters are marking their choices on their PC's, iPads, iPhones, MAC's, Chromebooks, and even on a Kindle.

We are pleased to provide information on the accessible AFB process and ballots to your county.

John Schmitt

President

Five Cedars Group, Inc.

Shuit

1. Introduction

An Alternate Format Ballot (also known as Accessible Absentee Ballot) is a single HTML file that is downloaded by, or emailed to, a voter needing an alternative to a paper ballot or physically going to a polling place to vote.

This document is focused on the ballot itself, the county's role and the how a voter interacts with both. Because the HTML ballots are created by a service provided by Five Cedars Group, those details are not germane to this discussion. The Alternate Format Ballot Generator program and how it works is discussed in fully in the <u>AFB Generator System Documentation.pdf</u> document.

1.1 System Description

HTML ballots can be read and marked on any system with a browser, screen reader, audio output, with or without a keyboard (touch screen). A typical configuration is a Microsoft PC running Windows 7, 8.1, or 10, IE or Edge browser, and using the Narrator screen reader that comes standard with Windows. The Summary page can be printed on any COTS laser or ink jet printer found in the voter's home. IPad users will use VoiceOver and an Airprint enabled printer to print the Summary page. Appendix A shows an overview of the entire ballot generation, distribution, personas of voters, and return of the ballot to the county. Appendix B shows a screen shot of a sample, marked ballot, a Summary page, and the printed Summary page, with barcode.

1.2 Ballot Marking Process

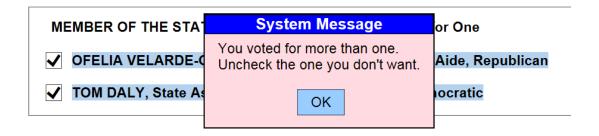
Sighted voters can navigate the ballot using a mouse, or by using the TAB and SPACE BAR. Voters with vision difficulties can make the text on the screen larger by pressing the "CTRL +" keys. Or, on a tablet, using the appropriate re-sizing gestures.

Voters with disabilities who have the computer systems capable of downloading a web page and either the dexterity or assistive tools (screen readers, joysticks, etc.) to navigate a web page will have no trouble navigating and marking an AFB ballot.

If a voter over-votes on a race or measure a message box immediately tells them to go back and uncheck a choice. Figure 2 shows the error message box that immediately tells a voter they've marked more than the allowable candidates for a race.

Fig. 2 – Over-vote message box informs voter of voting error.

Alternate Format Ballot



Once a voter has completed making their choices, they navigate to the Summary page which shows only the race and measure titles and their choices. Any under or over votes are noted. When the voter is ready, they print the Summary, either by using the button on the ballot or by going to the browser's print function.

When the Summary is printed, a barcode is also printed containing the voter's choices. This barcode can be scanned at a county office by a ballot-on-demand (BOD) system to produce a scan-able ballot for tallying. There is no voter identifying data in the barcode. If the county doesn't have BOD's, the barcode option can be turned off when Five Cedars creates the ballots.

After printing their Summary page, a voter puts the Summary in the proper "secrecy" envelop and mails their ballot to the county, just like they would a paper absentee ballot.

The ballot generation process requires the counties to upload their CSV ballot definition file to Five Cedars where they are processed into HTML ballot files and returned to the counties. Five Cedars provides the processing as software-as-a-service (SaaS). The details of this process are discussed in Section 3 below.

2. HTML Ballot Functional Overview

2.1 Enabling Voters With Disabilities to Vote Privately and Independently

The HTML AFB was specifically designed for voters with disabilities. It assumes limited mobility and vision. Once downloaded onto the voter's own system, the ballot is navigated and marked by the voter using the assistive tools most familiar to the voter, such as screen readers, sip and puff, joysticks, etc.

The HTML ballots leverage W3C and WCAG Accessibility Guidelines. Ballots generated by the AFB Ballot Generator perform all the functions required to meet accessibility standards outlined in NIST's draft report "Principles and Guidelines for Remote Ballot Marking Systems".

A few of them are:

- A ballot can be viewed one race at a time or the whole ballot at once. A voter can navigate back and forth between the two views of the ballot.
- Each race/measure can be checked for "over or under voting".
- The entire ballot can be checked for "over or under voting".
- Races can have as many write-in names as the "Vote for X" number each race allows.
- The Ballot Summary page displays a note indicating any "over or under voting".
- The screen and font sizes are easily scaled for ease of reading.
- All navigation indicators (buttons) are plainly identified and give visual cues when activated.
- All navigation indicators are placed near the left margins so as not be lost when the screen is enlarged by screen magnifier software or the zoom functions of the browser (CNTL +, CNTL -).
- At key sections of the ballot, there is additional "hidden" text in the HTML that only a screen reader user will hear. These auditory cues assist the blind voter to understand

Alternate Format Ballot

the organization of the ballot, what keys to press, and other navigation assistance that a sighted voter picks up visually.

The HTML ballots were originally designed specifically for the vision impaired and



disabled voters. As such, they work with the following assistive software:

- JAWS
- VoiceOver (Apple)
- Narrator (Microsoft)
- NVDA
- ZoomText
- Window Eyes
- Dragon (Nuance)

• ChromeVox (Google)

Fig 3 - Voter marking ballot via Jelly Bean input

The HTML ballots are self-contained, meaning once the single HTML file is loaded into a browser it does not request any data, graphics or navigation links from a server. Once a voter receives a ballot, there is no internet connection required. Voters can mark their choices, print their Ballot Summary, and complete the voting process, literally anywhere. All the ballot's functions are self-contained in the JavaScript contained in the ballot. This is important for the following reasons:

- Because the ballots don't rely on an active internet connection to work and the
 voting process is done entirely on the device the voter is using, there is no "refresh
 delay" or chance of a dropped connection, the device freezing, etc. interrupting the
 voting process.
- A Ballot can be emailed to a voter as an attachment, to be opened later, and marked at the voter's convenience. This is important for voters who have email access but don't necessarily have reliable web access. A typical HTML ballot is 80Kb to 120Kb in size.
- A state or county's entire collection of ballots for an election can be put on a laptop/tablet/USB device and carried into a facility that does not have an internet connection.
- They can be zipped/unzipped for bulk emailing to a remote location.

2.2 Ballot Functional Diagram

Figure 4 below shows the basic concepts of how the AFB HTML Ballots work. It is not a click-by-click explanation of the ballot code but does show the high level functions such as the multiple-view capability, making the ballot, error messages given at the time of marking, the Summary, and printing process.

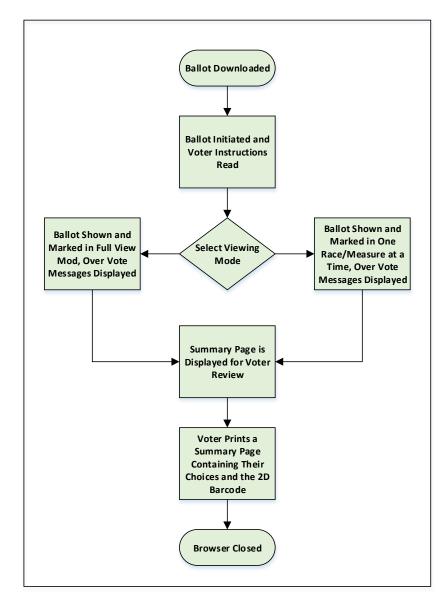


Fig 4 - HTML Ballot Basic Functional Flow

Alternate Format Ballot

2.3 County Staff AFB Training

The main purpose and beautify of the AFB accessible ballots is they allow voters with disabilities to download, mark, and return their ballot from home using their own PC or other accessible device. But, if the county is expecting to have "drop-in" voters requesting to use an accessible PC to mark a ballot, it is critical, for all the known reasons, that staff is trained to be able to assist a voter to download their ballot.

Since the HTML AFB ballot is really just a web page, the training required for county staff is minimal. Oregon did develop some step by step instructions to help county staff make the jump from Windows 7 to Windows 8/10. A sample of that training is shown in the Word doc on the USB –file named <u>AFB Surface Training.docx</u>. This is an example of the materials used by Oregon to train their counties to assist a voter who comes into a county office to use the Windows 10 system and the Narrator screen reader to mark their ballot.

Training county staff to be familiar and comfortable with HTML ballots is part of any AFB implementation. The purpose and expectation of the AFB training is that of "train the trainer". The customized training Five Cedars is prepared to deliver consists of:

- Introduction to the general AFB Process and Ballots.
- Specific steps for populating and generating AFB ballots from county data files.
- How to download an AFB ballot on various devices (PC, iPad, etc.).
- Demonstrations of typical usage of the ballot using a mouse, keyboard, touch screen, JAWS, sip and puff and Jelly Beans.
- Generating and printing a Summary Ballot page.
- Using a ballot-on-demand printer to generate a scan-able ballot.
- Other topics as needed for county specific requirements.

Onsite support should only be required during the initial implementation phase. Five Cedars' staff are willing to make onsite calls whenever the state requests such an activity.

Before any election cycle, Five Cedars can hold WebEx sessions for county staff demonstrating and giving the county staff hands-on experience downloading and using an AFB Ballot.

2.4 Voter Instructions - On Website

There is a minimum set of instructions that should be available on the county's website for a voter looking to download their HTML ballot. Examples of the types of instructions, webpage sequences, and an FAQ that could be provided are on the USB submitted in the <u>Ballots and Download Web Page folder</u>.

2.5 Voter Instructions – Within the Ballot

There are several points within the HTML ballot where "hidden" text has been inserted into the flow of the ballot to provide additional guidance to blind voters using a screen reader. A sighted voter can see there is a block of instruction text before the races and measures start. A blind voter doesn't know that so what they hear is "The Ballot choices will start after these instructions on how to mark your ballot."

Similarly, when a sighted voter gets to the end of the ballot, they can see the navigation buttons leading to the Summary page. A screen reader voter will hear "You've reached the

end of the ballot. Tab to buttons below to check the ballot for mistakes, go to the Summary page, and other navigation."

There are several other places in the ballot that additional navigation instructions have been provided for the unsighted voter.

3. County Interaction and Ballot Generation

3.1 County Role in Ballot Generation.

The ballot generation process requires the counties to upload their Hart BOSS 4.3 CSV ballot definition files to Five Cedars using our Citrix ShareFile secure file transfer service. County staff are given a login and password to ShareFile specifically for this purpose.

The required CSV files are:

- 1. ELECTION.txt
- 2. CANDIDATE.txt
- 3. CANDIDATE DETAIL.txt
- 4. CONTEST.txt
- 5. CONTEST_AND_PRECINCT.txt (could be named PRECINCT_AND_CONTEST.txt)
- 6. PARTY.txt
- 7. PRECINCT.txt

Once these files are received at Five Cedars, they are processed by the AFB Generator program and the HTML ballot files are built by combining the CSV data with pre-defined HTML templates. These templates, along with resulting sample HTML ballots, are what we've submitted for certification.

If the county has supplied XLF formatted translation files, ballots in the specified language will be generated. The AFB Generator and templates support the following languages: English, Spanish, Chinese, Hindi, Japanese, Khmer, Korean, Tagalog, Thai, and Vietnamese.

After generating the HTML ballots, Five Cedars does a visual check of the ballots to catch any anomalies that may have been caused by data issues. The next step is to send the completed ballots back to the county, again by the Citrix ShareFile path.

Once the HTML ballots are received by the county and verified to be free of data errors, the HTML files are uploaded to the county's "My Vote" site, in the same area that a voter enters or updates their registration data. This process and the security of the ballots is dependent on the county's staff making sure the ballots are loaded into a read only folder and accessible only by registered voters. Five Cedars has sample web site code that makes this process straight forward. Section 5 details this process.

Figure 5 shows the basic work flow for ballot generation.

A registered voter will download their AFB ballot from the County "My Vote" on-line registration system. During an active election, the voter logs in to the same place they make edits to their address, party affiliation, etc. where, during and active election, there will be a link to download their precinct specific ballot.

Alternate Format Ballot

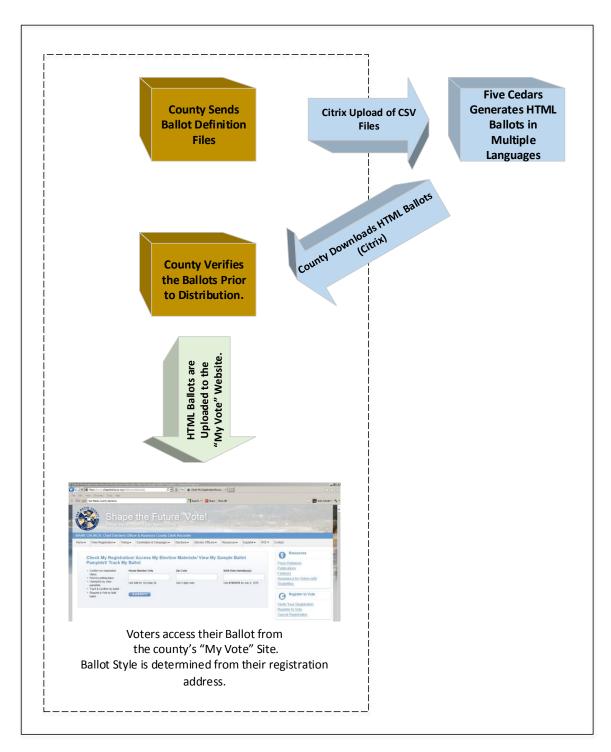


Fig 5 - Ballot Generation Process

Alternate Format Ballot

3.2 Returning Summary Pages to the County

The voter returns their Summary page the same way any vote-by-mail voter would, either by USPS or by using a drop box. The return envelope is supplied by the county as part of the voter packet that is mailed to every voter. A voter who creates an AFB summary doesn't use the ballot mailed to them. An unsighted voter signs the return envelope on the same line as a sighted voter.

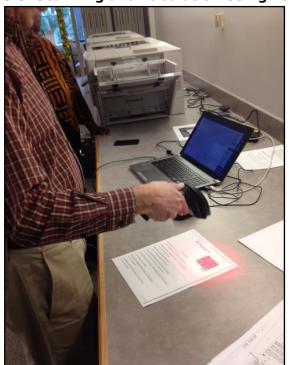
It's common practice for ballot return envelopes to have a punch hole in them. The hole is

used to make sure no ballots are inadvertently left in an envelope as a piece of yarn or string is passed through each box of "empty" envelopes. Oregon's return envelopes have two punches in them. It is actually a very simple but brilliant system. One hole goes all the way through the envelope and the other punch hole is only



through one layer of the envelope. The punches are lined up to guide an unsighted person to exactly where to sign their envelope.

3.3 Scanning and Tabulation Using Ballot on Demand Printers



once. The AFB generates a seven digit random number which is included in the barcode and printed below the barcode.

For jurisdictions that make use of ballot on demand printer (BOD) capabilities to duplicate ballots, the AFB generates a Data Matrix (ISO/IEC 16022) barcode on the Summary page. It containing only integer data representing the race position number and the relative position of the voter's choices. It will include the text of any write-in candidates. It also contains the county code, district, and precinct codes.

Using a smart phone app, the barcode shown in Appendix B's sample printed Summary page can be read to see how the voter's choices are read by a BOD printer. (A good app to use is the Datamatrix Scanner from Kenzap, Ltd.)

Another very important feature is the proactive way the BOD and the Summary page prevent a Summary page from being duplicated more than

Fig 6 - Summary page being scanned

The BOD software will associate this number with the Summary page and will not allow that Summary page to be scanned a second time. That random number can also be printed in the margin of the duplicated, scan-able ballot page for audit purposes. The barcode feature is turned on or off by a parameter set by the AFB Generator program.

Oregon counties have been using barcodes with ES&S ballot on demand printers for several years and find the duplication process to be quick, accurate, and easy to accomplish.

The specifications and additional documentation for the Data Matrix barcode is on the ID Automation site:

http://www.idautomation.com/barcode-fag/2d/data-matrix/#Data Matrix Overview

4. Acceptance and Accessibility Testing

This section discusses how the county can do minimal functional testing or extensive accessibility testing to determine if the ballots are working correctly.

4.1 Acceptance Testing

The HTML ballots are a single web page with lots of built-in, complex logic. However, it turns out that there are a few simple tests or observations that one can try that typically will indicate if the ballot is working properly. These simple tasks will not guarantee that a screen reader will work properly, as those test are described in Section 4.2.

The following are a few simple tests that should indicate an HTML ballot is functioning properly:

- 1. If the checkboxes are real small and pushed to the left, it's an indication that JavaScript is turned off in the browser. If JavaScript is turned on, it's an indication the ballot is broken. You should never see this condition.
- 2. If none of the buttons appear or don't work, again, check that JavaScript is turned on. If JavaScript is turned on, it's an indication the ballot is broken. You should never see this condition.
- 3. Try a few navigation tasks: Click to "one race @ a time", does the tab move the cursor up and down through the ballot, can you display the Summary page, does the Summary match what you voted, if you over vote does an error pop up?

These are all basic indications that a ballot is working properly. Again, you should never see these conditions. If you do, the ballot has been damaged or compromised.

4.2 Accessibility Testing

To test a screen reader's ability to read, navigate, mark the ballot using only the tab and space bar, there are a set of "commands" that should be executed to make sure the combination of the operating system (OS) and the screen reader actually are supported by the AFB Ballot. Five Cedars has developed a matrix of OS vs screen readers and an AFB Test Plan Matrix included on the submitted USB – File named <u>AFB QA Environments May 2017.xlsz.</u>

There are operating system and screen reader combinations, such as Microsoft's new browser, Edge, and Narrator that currently do not support accessibility due to Edge's poor support for screen readers.

Alternate Format Ballot

Windows Environments \ Screen Readers	JAWS V17.0-18.0	Narrator	NVDA ³ 2017.1	Win-Eyes ¹ V9.2.1	ZoomText 11.2
Win 7 Internet Explorer					
11	Passed	N/S	Passed	Testing	Testing
Win 7 FireFox v52.0	Passed	N/S	Passed	Testing	Testing
Win 7 Chrome v45.0	Passed	N/S	Passed	N/S	Testing
Win 8.1/10 IE 11	Passed	Passed	Passed	Testing	Testing
Win 8.1/10 FireFox v52.0	Passed	Passed	Passed	Testing	Testing
Win 8.1/10 Chrome					
v57.0	Passed	Passed	Passed	N/S	Testing
Win 8.1/10 Edge					
Browser	N/S	N/S	N/S	Testing	Testing
Other Environments \			Explore By		
Screen Readers	Voiceover	ChromeVox	Touch		
iPad Safari (IOS 10)	Testing				
iPad Chrome v53 (IOS					
10)	Testing				
Mac Safari (10.6.8, 10.7)	Testing				
Mac Chrome (10.6.8,					
10.7)	Testing				
Google Chromebook ⁴		Passed ⁴			
Kindle Fire ^{4 & 5}			Passed ^{4 & 5}		

Figure 7 shows the screen readers and platforms (OS) that are supported by the current (May 2017) version of the HTML Alternate Format Ballots. This table will be updated as new platforms come to market, operating systems are updated, and screen readers are enhanced or become more relevant to the voting population.

Note: All of the above OS and Browsers have been tested in the sighted, screen reader, and bi-modal navigation modes (tab & space bar). N/S = Currently Not Supported

Errata:

- 1 GW Micro does not currently support usage of Window-Eyes on Chrome.
- 2 While Narrator works on Win 7, it's not recommended.
- 3 NVDA (NonVisual Desktop Access) Open Source free program from Australia (Note: When changing to Single view mode, voter needs to use down arrow to hear first race title.)
- 4 Both the Chromebook and Kindle Fire require WiFi for printing.
- 5 Kindle Fire is usable device but the screen reader can be touchy.

5. Registration Page Additions for Hosting HTML Ballots

Five Cedars Group, Inc. Page 15

5.1 Download Pages - Where to Host the Ballots

This section explains why a County's registration "My Vote" site and server should be used to host the AFB's HTML ballots. Generated accessible HTML ballots are stored in a folder, by language, and are retrieved when a voter clicks the "My Ballot" link on their voter registration page.

Reasons for a County to host their own HTML Ballots:

- 1. It's very easy to implement and puts a very, very small load on the server. The HTML ballots are very small (85-130K) and once the download is completed, there is no further load on the server. It's the equivalent to downloading a small picture every few hours.
- 2. For security reasons it's better to have the ballots on the same server they use, and protect, for voter registrations.
- 3. The added code to facilitate the download is not complicated. Sample code is on the USB.
- 4. The folder the ballots would reside in should not be more than a 100-300Mb, depending on how many languages the county required ballots to be translated into.

Whether the County decides to host the download themselves or Five Cedars does, the process is the same.

5.2 How a Voter Gets the Right Ballot Style - How the Magic Happens

Since the voter's registration contains their location information (precinct, district, language preference, etc.) an HTML link on the registration page to their correct ballot style can be pre-generated using the ballot style data in the voter's record. The ballot style numbers are appended to the ballot file name ($\underline{Orange} < !-language \rightarrow < !-- precinct # -->.html)$ in the HREF anchor tag before the page is generated.

For instance, if the voter's precinct number is 02001, that's the number that would be inserted into the link creating an HTML command like this:

My_Ballot.

The "es" indicates it's a Spanish ballot.

5.3 Website Coding Materials

The HTML pages in the <u>Ballots and Download Web Pages</u> folder give live examples of how the registration pages have been modified in Oregon's implementation to serve up the correct ballot style to only registered voters. Clicking on the <u>Welcome to My Vote Page!.html</u> page takes you to a sample registration login page. Typing any name will take you to a sample voter's registration and to the "<u>My Ballot</u>" link to download a ballot. Additionally, Five Cedars will work closely with the County's web team to insure a successful implantation.

5.4 Simplified Voter Instructions

There is a digital copy of the type of voter instructions that should be available on the county's "My Vote" site for a voter with a disability. The text is taken from the Oregon My Vote site and is an example of the type of help provided, especially for blind voters. It is

Alternate Format Ballot

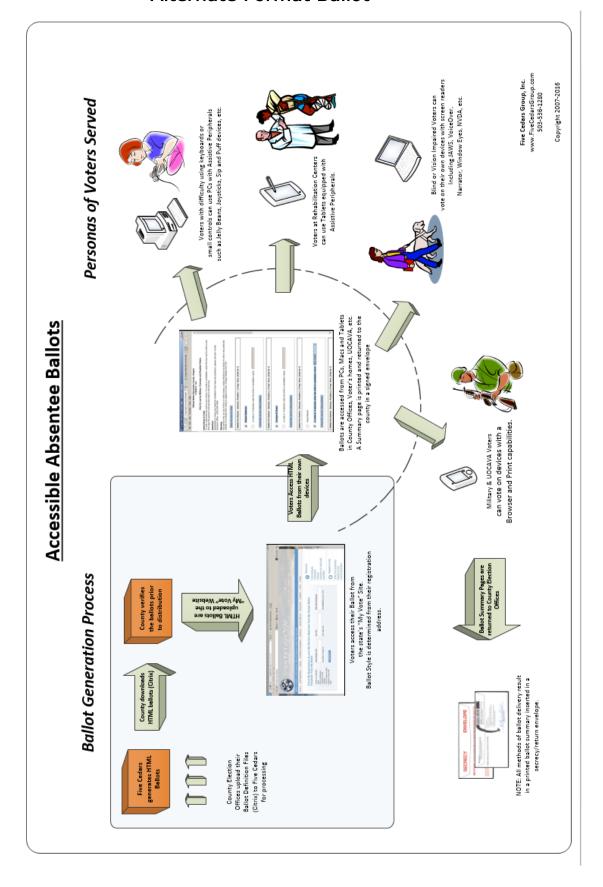
very straight forward, simple, yet complete with an FAQ. The file is on the USB – File named <u>Voting Instructions for Voters with a Disability.docx</u>.

6. AFB System Meets Security Standards

The basic premise of the security of the AFB accessible ballot process is that the vote-by-mail system's security is intact. All the AFB process does is replace the scan-able ballot mailed to the voter with a Summary printed by the voter. All the envelope and signature security measures are the same. The processing at the county is the same as any ballot that needs to be duplicated due to coffee stains, "the dog ate it", etc.

Since an AFB HTML ballot does not need an active internet connection to work and since, once downloaded, it never makes any attempt to connect to the internet, there is no risk of the voter's choices being changed by some nefarious hacker. And, the voter can verify their vote choices before mailing their printed Summary. The process of downloading a single HTML file from a secure county/state server conforms to EAC, California, and NIST recommendations for election security.

The AFB HTML ballot does not, on its own, retain a voter's votes. Once the HTML file is downloaded to a voters system, there is no built-in way to prevent a ballot from being saved on their system. However, once the browser is closed, all choices made by the voter are lost. Even if someone were to go to the browser history to re-load the HTML ballot, it would load as a fresh ballot with no choices selected. The voter's printed Summary page contains no identifiable information to link their Summary back to them.

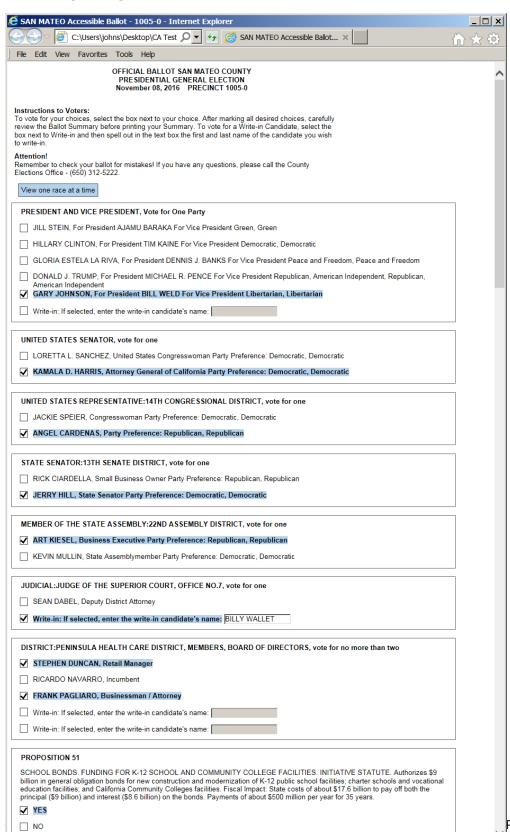


Appendix A
Alternate Format Ballot (AFB) Process

Alternate Format Ballot

Appendix B

Sample English and Chinese HTML Ballot Screen Shots



Five Cedars

Appendix C

Sample English and Chinese AFB Summary Pages with Barcodes

Oregon Alternate Format Ballot - 99-D

Page 1 of 1

Official Special Election Ballot - Alfalfa County, Oregon 5/21/2014 - 99-D (For demonstration purposes, not an official ballot)



436320

Summary of Votes.

Race 1 of 4 Alfalfa Fire District: Director, 4 Year Term (Vote for 1).

You voted for: Betsy Roberts

Race 2 of 4 Alfalfa School District: Ombudsmen, 2 Year Term (Vote for 1).

You voted for: Roland Jarka

Race 3 of 4 Alfalfa Water Works: Director, 2 Year Term (Vote for 1).

You wrote in: Billy Wallet

Race 4 of 4 City of Bend: City Manager, 3 Year Term (Vote for 1).

You voted for: Kevin Johnson

Measure 1 of 2Alfalfa Fire District: Ballot Measure 9-95 - To Form a Fire District and Establish a Tax Rate Limit

You voted: Yes

Measure 2 of 2Deschutes County: Ballot Measure 9-96 - Increase Deschutes County Transient Room Tax by 1%

You voted: No

Oregon Alternate Format Ballot - 99-D

End of Summary Page